I take pleasure in naming this species for Dr. R. M. Bohart, University of California, Davis, who has contributed to our knowledge of Chrysididae.

ACKNOWLEDGMENTS

Material has been examined and deposited in the following institutions: California Academy of Sciences (CAS); University of California at Berkeley (CIS); Canadian National Collection, Ottawa (CNC); Cornell University (CORN); University of Idaho, Moscow (IDAHO); Los Angeles County Museum (LACM); United States National Museum (USNM); University of California at Davis (UCD).

I appreciate the help of Mr. R. O. Schuster and Miss Susan K. Senser who gave assistance in the preparation of the illustrations.

A Synopsis of the Nearctic Species of *Antichaeta* Haliday with One New Species

(Diptera : Sciomyzidae)

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We refer the North American species of *Antichaeta* to black forms (our designation) and the "yellow forms" of Steyskal (1960) as follows: The black forms (*A. johnsoni* (Cresson), *A. melanosoma* Melander, *A. canadensis* (Curran)) are the dominant species east of the Rocky Mts., and the "yellow forms" (testaceous is more accurate) (*A. fulva* Steyskal, *A. borealis* Foote, *A. testacea* Melander, *A. robiginosa* Mel., and *A. vernalis* Fisher and Orth[2] n. sp.) are the dominant representatives of the genus from the Rocky Mts. to the Pacific Ocean. Steyskal (1960: 25) based his interpretation of the phylogeny of the "yellow forms" in part on the status of the anterior surstyli. We have seen males of all five "yellow forms" and agree that these structures are lacking in *A. fulva.* However, both left and right anterior surstyli are present in the four remaining species.

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[1] Specialist and Laboratory Technician, respectively.
[2] Fisher and Orth hereafter abbreviated F. & O.

Five of the eight species of *Antichaeta* known to occur in North America have been collected only above 40° N. Latitude.[3] The southernmost record known in California is that of *A. testacea* from the Laguna Mts., San Diego Co., approximately 15 miles north of the Mexican border, 33° N. Latitude. *Antichaeta testacea* is the most widespread and numerous species collected in California, approximately 300 specimens have been collected since 1962. It occurs the length of the state and has been taken from sea level to 7,000+ feet elevation. *Antichaeta vernalis* and *A. robiginosa* (except for an isolated male labelled Woodlake, Calif., approximately 36° 30′ N. Latitude) occur north of 39°. *Antichaeta borealis* was collected only once in extreme northeastern California.

A few reference specimens of most species were loaned to us by L. V. Knutson (United States National Museum) and B. A. Foote (Kent State University, Kent, Ohio). Our assessment of these specimens along with published keys and descriptions were used to formulate a key based on reasonably constant gross (external) characters by which the eight North American species can be separated. Determinations can be confirmed by examination of the male postabdomen at 40–70× magnifications following excision and light boiling in 10% KOH.

The bicolored character of the 3rd antennal segment is most pronounced in *A. borealis* and *A. fulva*, less so in *A. robiginosa* and *A. testacea*, and least in *A. vernalis*.

In the testaceous ("yellow") species, females are commonly more intensely colored than the males. The eighth and last sterna are also helpful in distinguishing females, but are not highly reliable characters. The aristal plumosity, i.e., length of longest aristal hairs, which grades from rather long, as in *A. robiginosa* (Fig. 6) and *A. testacea*, to short in *A. vernalis* (Fig. 7) is more reliable. Lengths of longest aristal hairs of *A. borealis* and *A. fulva* fell between the extremes and in that order.

On the basis of characters of the immature as well as adult stages, Knutson (1966: 72) considered *Hemitelopteryx brevipennis* (Zett.) as congeneric with *Antichaeta analis* Meigen, the type species of *Antichaeta* Haliday. This corroborated the work of Steyskal (1960) who had transferred *Hemitelopteryx johnsoni* to *Antichaeta* (subgenus *Parantichaeta*).

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[3] Six species of this holarctic genus have been described from northern and central Europe, the southernmost being *A. analis* (Meigen) from Lake Balaton, Hungary (47° N. Latitude)—(Knutson, 1966:73).

KEY TO THE NEARCTIC SPECIES OF ANTICHAETA

1. Scutellum with 2 bristles. 1 pair dc. Head and palpi black; 1 pair fo; antennae yellowish, aristal hairs short, dense, black. Thorax testaceous; dorsum with 2 broad blackish stripes joined at anterior margin. Fore coxae whitish; legs yellowish, except for black fore tibiae and tarsi. Abdomen blackish brown. Massachusetts, New Hampshire, New York, Ontario. [Cresson, 1920: 51; Steyskal, 1960: 19] ..... *johnsoni* (Cresson)

   Scutellum with 4 bristles. 2 pairs dc. 2

2. 1 pair fo. Head: frons and palpi black; anterior and ventral margins of eyes with whitish-pruinose border; antennae yellowish, aristal hairs short, dense, black. Thorax black; forelegs black distad of middle of femur, basal half of fore femur and middle and hind legs yellowish except for brownish 4th and 5th tarsal segments. Abdomen black. Michigan, New York, North Dakota, Ohio, Ontario, Quebec, Utah, Wisconsin. [Melander, 1920: 318; Steyskal, 1960, Fig. 1] ..... *melanosoma* Melander

   2 pairs fo. 3

3. Head: frons blackish, anterior margin extensively to slightly yellow; medifacies black to yellow; anterior fo one-half to two-thirds length posterior fo; palpi brown to black; antennae yellow; aristal plumosity short, dense, black. Thorax black. Forelegs black distad of middle of femur; basal portion of fore femur and middle and hind legs yellowish except for brownish 4th and 5th tarsal segments. Abdomen black. Alberta, Maine, Manitoba, Michigan, North Dakota, Ontario, Saskatchewan, Wisconsin. [Curran, 1923: 277; Steyskal, 1960: 20, Fig. 8] ..... *canadensis* (Curran)

   Head yellow to testaceous; aristal hairs black. Thorax and abdomen mostly testaceous; dorsum with 2 narrow brown median vittae bordered by broader, pruinose stripes; legs yellowish to testaceous, 4th and 5th tarsal segments brownish, forelegs infuscated (tibia and tarsus black in *A. borealis* female). Females usually more intensely pigmented than males. ("yellow forms" of Steyskal, 1960) 4

4. Anterior fo approximately half length posterior fo. Antenna testaceous, 3rd segment blackish on apical half, more or less; aristal plumosity short, sparse (longest hairs average length 0.073 mm; range of 2 specimens 0.070 mm–0.075 mm). Abdomen brown, infuscated; male andrium and terminal segments of female testaceous. Idaho, New York. [Steyskal, 1960: 20, Figs. 2–4] ..... *fulva* Steyskal

   Anterior and posterior fo nearly equal in length 5

5. Thoracic dorsum mostly testaceous 6

   Thoracic dorsum mostly cinereous blue 7

6. Antenna testaceous, 3rd segment blackish on apical half, more or less; aristal plumosity sparse, somewhat longer than in *A. fulva* (longest hairs average 0.095 mm; range of 3 specimens 0.090 mm–0.100 mm). Distal portion of foretibia and entire tarsus black in female, infuscated in male, as in other "yellow forms." California, Idaho, Montana, Ohio, New York. [Foote, 1961: 161–2, Fig. 1] ..... *borealis* Foote

Antenna testaceous; 3rd segment lightly tinged with black on apical half, more or less; aristal plumosity sparse, long (as in *A. robiginosa*) (longest hairs average 0.116 mm; range of 15 specimens, 0.112 mm–0.127 mm). Abdomen testaceous, mottled; andrium uniformly testaceous. California, Idaho, Montana, Oregon, New Mexico, South Dakota, Utah. [Melander, 1920: 318; Steyskal, 1960, Figs. 5–7] ..... *testacea* Melander

7. Antenna testaceous; 3rd segment usually tinged with black on apical half, more or less, occasionally only lightly tinged with brown; aristal plumosity, long, sparse (Fig. 6) (longest hairs average 0.129 mm; range of 16 specimens, 0.120 mm–0.142 mm). Thorax testaceous; dorsum with 2 narrow brownish vittae bordered by much broader pruinose cinereous-blue vittae. Sides of thorax whitish-pruinose, except for upper half of pro-, meso-, and pteropleuron. Male postabdomen, Figs. 1–4; female terminalia, Fig. 5. California, Montana, Oregon, Washington, Nova Scotia (Stone, et al., 1965: 688). [Melander, 1920: 317] ..... *robiginosa* Melander

Apical half to two-thirds of 3rd antennal segment at most lightly tinged with brown; aristal hairs sparse, short (Fig. 7) (longest hairs average 0.062 mm; range of 7 specimens 0.055 mm–0.067 mm). Thoracic dorsum as in *A. robiginosa*; female, sides of thorax pruinose, cinereous-blue; upper third of pro-, meso-, and pteropleuron testaceous. Lateral coloration not as pronounced in male, similar to male of *A. robiginosa*. Male postabdomen, Figs. 8–11; female terminalia, Fig. 12. California, Idaho, Oregon, Washington (see section on variant) ..... *vernalis* Fisher and Orth, n. sp.

Descriptions

The original description of *Antichaeta robiginosa* Melander was based on a single female labelled 3-Forks, Montana, 1 August 1918 (Melander, 1920) [Three Forks, Gallatin Co.]. A male labelled Roberts, Marion Co., Oregon, 5 March 1940 (coll. R. E. Rieder) assumed to be this species, was figured by G. C. Steyskal (1960, Figs. 10–11) and those drawings formed our concept of the species until late May 1969.

During a survey of the family Sciomyzidae in California,[4] a form which did not fit the published descriptions of species of *Antichaeta* was collected. We considered it to be a new species and the first draft of the present paper was prepared in that context. However, after L. V. Knutson compared Melander's holotype female and several male specimens of *A. robiginosa* in the collection of the United States National Museum with drawings of our proposed new species, he (correspondence with R. E. Orth, 27 May 1969) concluded that our presumed "new species" actually was *A. robiginosa* and that Steyskal (1960) had inadvertently figured our *vernalis*.

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[4] University of California, Agriculture Experiment Station Project No. 2037.

We have seen the specimen from Roberts, Oregon, that Steyskal figured, and it fits our concept of *A. vernalis*. *Antichaeta robiginosa* and *A. vernalis* n. sp. are closely similar in gross aspect. Consequently, a photo only of *A. robiginosa* is shown (Fig. 13).

The original description of *A. robiginosa* is insufficient to separate it from closely related species. Accordingly, we are redescribing the species on male characters, and are designating a neallotype male.

ANTICHAETA ROBIGINOSA Melander

NEALLOTYPE MALE.—*Head.* Frons subshiny, yellowish except for shiny meso- and parafrontal stripes and very narrow whitish-pruinose stripes bordering eyes. Occiput in oblique view (looking directly down onto frons) with brown median area bordered by two elongate whitish-pruinose spots; ochraceous laterally. Face strongly pruinose, medifacies and oral margin largely yellow, parafacies whitish. Palpi testaceous. Antennae testaceous; first segment very small; second bowl-shaped, shorter than high; third compressed, ovoid, nearly twice as long as high; first and second segments lightly pruinose; third segment pubescent, apical ½ to ⅔ tinged with black; arista black, plumose (Fig. 6). Two pairs of fronto-orbital bristles; anterior pair approximately 0.75 length of posterior pair.

Thorax. Testaceous laterally; pleura heavily pruinose below, lightly so above; sternopleura and hypopleura darkened, pruinosity silvery. Dorsum with two parallel brownish vittae, bordered by broader pruinose cinereous-blue vittae; testaceous and pruinose laterally. Scutellum brownish. Forelegs brownish, partially infuscated; mid- and hind femora and tibiae ochraceous, tarsi lightly ochraceous, fourth segment partially infuscated, terminal segment wholly infuscated. Halters testaceous. Wing, 5.0 mm.

Abdomen. Testaceous, mottled; andrium uniformly testaceous. Postabdomen as figures 1–4. Wing length, 11 ♂—4.8 mm–5.5 mm (average 5.2 mm).

FEMALE.—Color as male. Wing length, 7 ♀—5.2 mm–5.5 mm (average 5.3 mm). Terminalia as in figure 5.

NEALLOTYPE MALE.—Collected two miles south of Alturas, Modoc Co., California, elevation 4,300 feet, Latitude 41° 28′ North, Longitude

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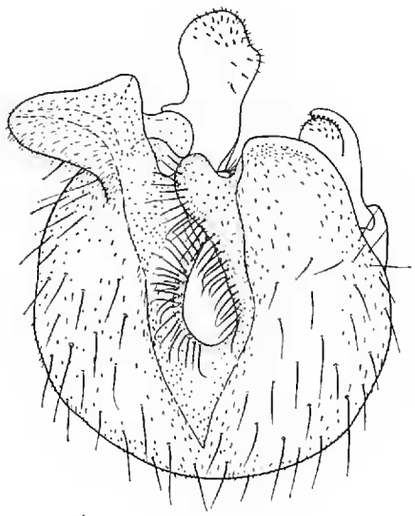
FIG. 1–4. *Antichaeta robiginosa* Melander. Allotype, male. U.S.A., Calif., Shasta Co., 5¼ mi. NW/Anderson, 480 feet elev., 24 May 1967 (T. W. Fisher and R. E. Orth), AS-571. FIG. 1. Postabdomen, posterior view, inverted; FIG. 2. Postabdomen, dextral view; *as*, anterior surstylus. FIG. 3. Postabdomen, sinistral view; *as*, anterior surstylus. FIG. 4. Fifth sternum. FIG. 5. *Antichaeta robiginosa* Melander. Female. U.S.A., Calif., Modoc Co., 2 mi. S/Alturas, 4,300 feet elev., 6 June 1967 (TWF & REO), AS-593. Terminal sterna. FIG. 6. *Antichaeta robiginosa* Melander. Female. U.S.A., Calif., Mendocino Co., 2 mi. N/Willits, 1,330 feet elev., 12 June 1966 (TWF & REO), AS-482. Dextral antenna. FIG. 7. *Antichaeta vernalis*. Paratopotype, female. U.S.A., Calif., Mendocino Co., 2 mi. N/Willits, 1,300 feet elev., 11 April 1967 (R. A. Shippey, U. C. Agr. Ext.). Dextral antenna.



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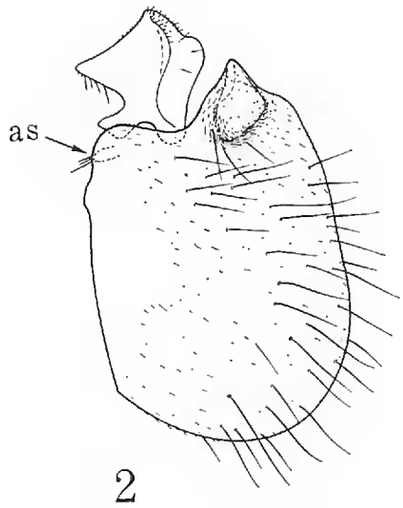

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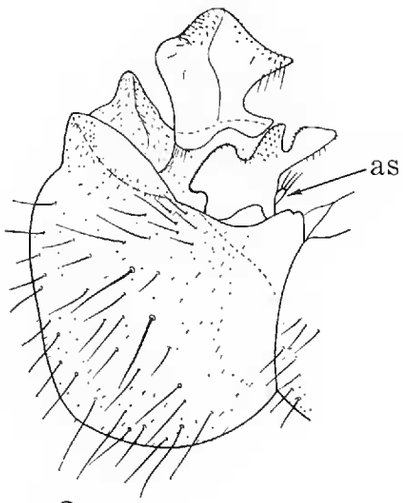

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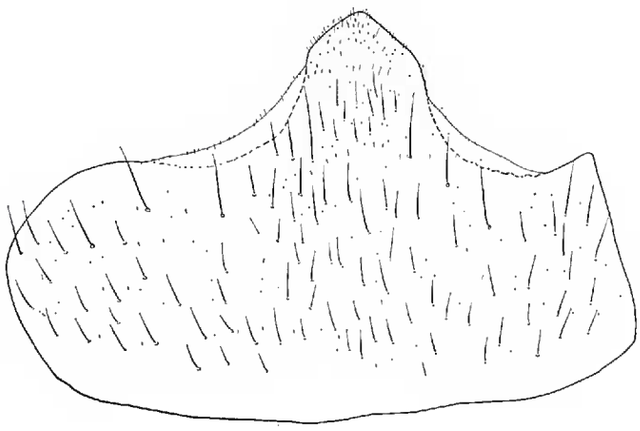

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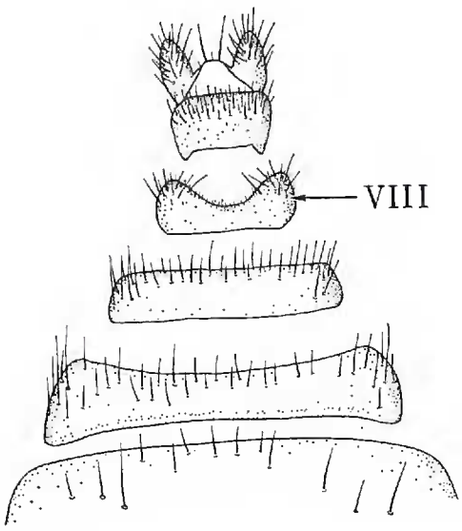

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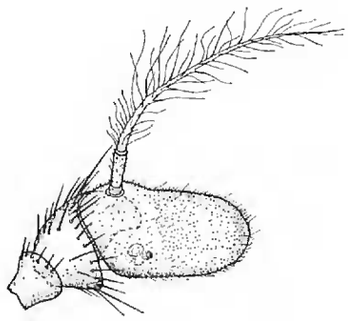

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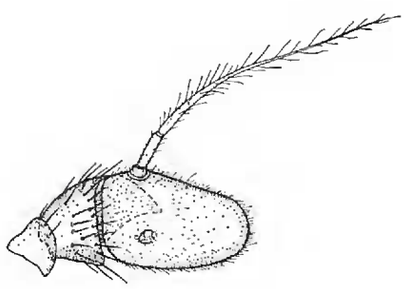

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120° 32′ West approximately, 10 June 1966 (T. W. Fisher and R. E. Orth) Field Accession No. AS-463.

DISTRIBUTION.—CALIFORNIA: *Inyo Co.*: 1 ♂, Deep Springs Lake, Buckhorn Springs, 5,000 feet, 16 April 1966 (F. & O.), AS-413. *Mendocino Co.*: 1 ♀, 2 mi. north of Willits, 1,330 feet, 16 May 1966 (R. A. Shippey); 1 ♂, 2 ♀, 12 June 1966 (F. & O.), AS-482; 2 ♂, 11 April 1967 (R. A. Shippey); 2 ♂, 23 April 1968 (F. & O.), AS-669 (Fig. 13). *Modoc Co.*: 2 mi. south of Alturas, 4,300 feet, 1 ♂, 10 June 1966 (F. & O.), AS-463; 1 ♀, 6 June 1967 (F. & O.), AS-593; 1 ♂, 3 mi. north of Eagleville, 4,640 feet, 10 July 1968 (F. & O.), AS-703; 1 ♀, north of Likely, 4,400 feet, 8 June 1966 (F. & O.), AS-453; 1 ♂, Willow Ranch, 4,700 feet, 9 June 1966 (F. & O.), AS-460. *Mono Co.*: 1 ♀, Mono Lake, 21 July 1911 (J. M. Aldrich coll., det. L. V. Knutson, USNM). *Shasta Co.*: 1 ♂, south of Redding, Mosquito Abatement District Headquarters, 480 feet, 24 May 1967 (F. & O.), AS-571. *Tulare Co.*: 1 ♂, Woodlake, in rotary trap, 24 May 1947 (no collector given, U. C. Berkeley). MONTANA: 1 ♀, Holotype, 3-Forks, (Three Forks, Gallatin Co.) 1 August 1918 (A. L. Melander, USNM). OREGON: *Lake Co.*: 1 ♀, 9 mi. south of Lakeview, 4,750 feet, 8 August 1968 (F. & O.), AS-748. *Lane Co.*: 1 ♀, west of Eugene, 400 feet, 8 August 1968 (F. & O.), AS-739. *Wasco Co.*: 1 ♂, 13 mi. north of Warm Springs, Hwy 26, 2,600 feet, 18 June 1969 (R. E. Orth), AS-790. WASHINGTON: *King Co.*: Seattle, 3 ♂ (no date, J. M. Aldrich coll., det. L. V. Knutson, USNM).

DEPOSITION OF NEALLOTYPE AND ADDITIONAL MATERIAL.—Neallotype and four specimens, United States National Museum; four specimens, California Academy of Sciences; seven specimens, Department of Entomology, University of California, Riverside.

Antichaeta vernalis Fisher and Orth, new species

Antichaeta robiginosa, Steyskal 1960, figs. 10–11 (not Melander 1918; misidentified).

Coloration and morphology as stated for *A. robiginosa* except as follows:

HOLOTYPE MALE.—Antenna, apical ⅔ of third segment at most lightly tinged with brown; arista dark brown, hairs black, short (not plumose). Tarsi, lightly infuscated. Wing, 5.0 mm. Postabdomen as in figures 8–11.

ALLOTYPE FEMALE.—Thorax, approximate upper ⅓ of meso- and pteropleura and most of propleuron testaceous, pruinose cinereous-blue below. Wing, 5.2 mm. Terminalia as in figure 12.

Holotype male, 2 MI. NORTH OF WILLITS, MENDOCINO COUNTY, CALIFORNIA, Hwy 101, 1,330 feet elevation. Latitude 39° 27′ North, Longi-

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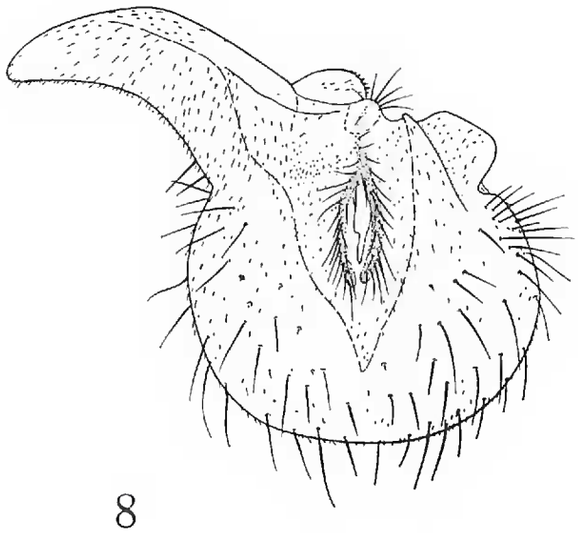
FIG. 8–12. *Antichaeta vernalis* Fisher and Orth, n. sp. Holotype. FIG. 8. Postabdomen, posterior view, inverted. FIG. 9. Postabdomen, dextal view. FIG. 10. Postabdomen, sinistral view. FIG. 11. Fifth sternum. FIG. 12. Allotype: terminal sterna.



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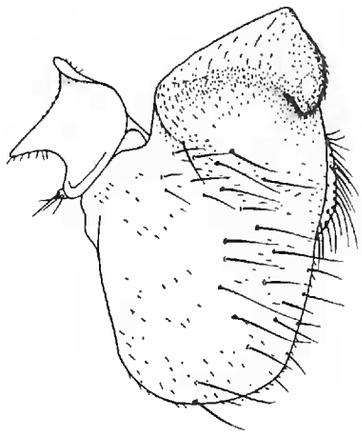

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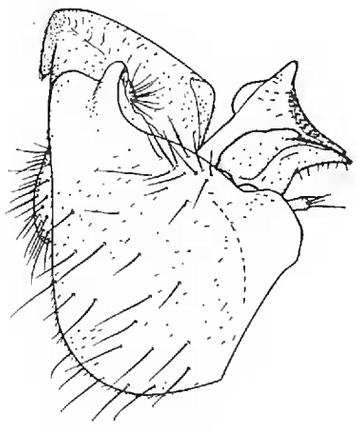

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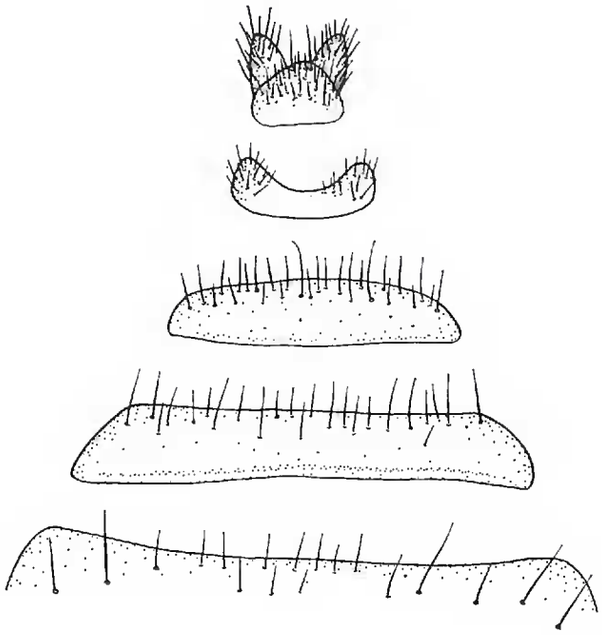

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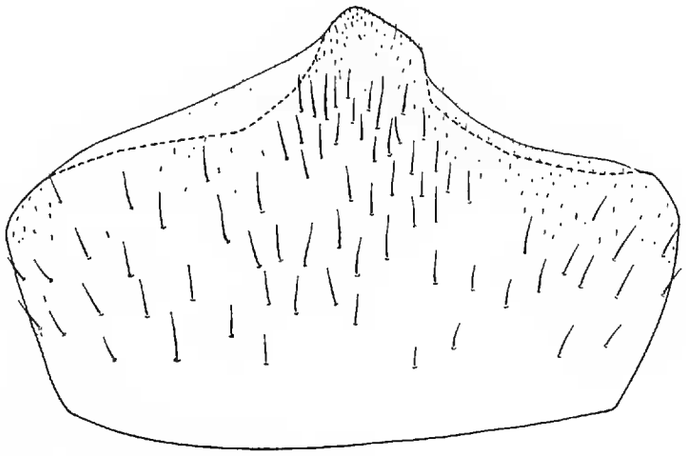

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tude 123° 21′ West, 23 April 1968 (T. W. Fisher and R. E. Orth), field accession number AS-669. Allotype female, same locality, 24 April 1968 (F. & O.), AS-671.

PARATOPOTYPES.—1 ♂, 1 May 1967 (R. A. Shippey, genitalia only—specimen mutilated beyond repair); 2 ♀, 11 April 1967 (R. A. Shippey); 1 ♀, 23 April 1968 (F. & O.), AS-670. PARATYPES.—CALIFORNIA: *Plumas Co.*: 1 ♂, 1 ♀, Rock Creek, Hwy 36 (40° 20′ N., 121° 06′ W.) 4,900 feet, 8 June 1966 (F. & O.), AS-451. OREGON: *Marion Co.*: 1 ♂, Roberts, 5 March 1940 (R. E. Rieder).

OTHER MATERIAL.—IDAHO: 1 ♀, Moscow Mt., 10 August 1924 (A. L. Melander). OREGON: *Marion Co.*: 1 ♀, Turner, 8 March 1942 (R. E. Rieder). [Rieder (Personal correspondence with T. W. Fisher, 18 November 1969) fixed his collection localities as Roberts, approximately 5 miles southwest of Salem on River Road, and Turner, approximately 10 miles southeast of Salem—both distances as measured from the center of the city.] WASHINGTON: 1 ♀, Mirror Lake, (Whatcom Co. ?), 26 June 1941, Bishopp, No. 29135, Lot No. 41-13667 (Yates and Knipling; J. M. Aldrich collection, det. L. V. Knutson, USNM).

VARIANT.—The male and female (wing lengths, 4.4 mm and 4.5 mm, respectively) from Rock Creek, Plumas Co., California, not only are smaller than the other paratypes, but their coloration is very similar to that of *A. robiginosa*. Short aristal hairs and terminalia appear to be identical to *A. vernalis*.

The name of the new species is derived from the latin *vernalis* (= of, or belonging to spring) and alludes to the season when this species was most often collected.

DEPOSITION OF TYPE MATERIAL.—Holotype and allotype, California Academy of Sciences, CAS No. 10208. The male paratype from Roberts, Oregon, was returned to Oregon State University.

FIELD OBSERVATIONS

The neallotype male of *A. robiginosa* was collected in the Modoc National Wildlife Refuge, two miles south of Alturas. The roadside ditches along Highway 395, which transects the refuge, were the usual collecting sites. This location is at the western fringe of the Great Basin biocoenose at approximately 4,350 feet elevation on the west side of the Warner Mountains. It is part of a broad, flat, marshy valley which is drained by the South Fork of the Pit River. In Modoc Co. 25 of the 44 species of Sciomyzidae known to occur in California were found. A total of 6 *A. robiginosa* occurred in 5 of 51 samples collected with a D-Vac suction collector and with aerial-sweep nets near Alturas during a four-year period. In these 51 samples, 5 *A. testacea* and 1 *A. borealis* were collected in 2 and 1 samples, respectively. *A. robiginosa* accounted

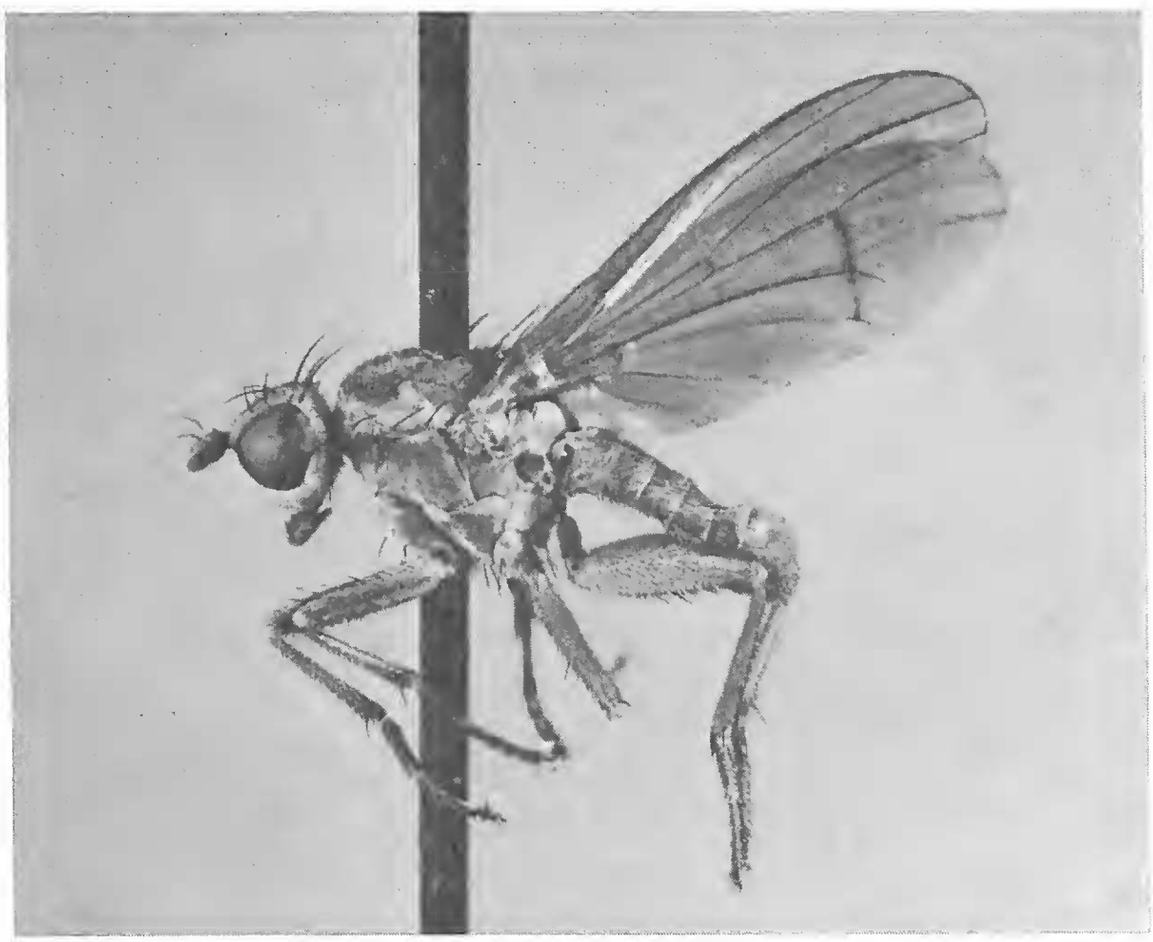

FIG. 13. *Antichaeta robiginosa* Melander, male. U.S.A., Calif., Mendocino Co., 2 mi. N/Willits, 1,330 feet elev., 23 April 1968 (TWF & REO), AS-669.

for two percent of the population of sciomyzid flies in samples in which it occurred.

Although an uncommon species itself, considering all areas collected, *A. robiginosa* occasionally occurs with other species of *Antichaeta*. *A. robiginosa* and *A. borealis* occurred together in a marshy meadow on the east side of the Warner Mountains, 3 miles north of Eagleville, 4,640 feet elevation (41° 20′ N., 120° 08′ W.). At Buckhorn Springs near Deep Springs Lake, Inyo Co., 5,000 feet elevation (37° 21′ N., 118° 00′ W.), *A. robiginosa* and *A. testacea* have been collected only on separate dates, indicating a possible difference in seasonal activity. In Mendocino Co. at the *A. vernalis* type locality, *A. robiginosa* and *A. vernalis* occur in the same marshy pasture along Highway 101 two miles north of Willits. In the Alturas area a curious distributional relationship of *A. robiginosa* and *A. testacea* was observed. *Antichaeta robiginosa* but not *A. testacea* was collected along Highway 395 between Alturas and Likely, 18 miles to the south, and *A. testacea* but not *A. robiginosa* was collected approximately 8 miles west of Alturas along

Highway 299. Close similarities of elevation, habitat, and snail fauna throughout this area apparently mask the critical factors which are responsible for the separation of these two species.

Although *A. robiginosa* presently is found mainly well above 1,000 feet elevation and above 40° North Latitude, its previous distribution probably covered a much broader geographic range, including much of the Sacramento and San Joaquin Valleys of California. This is indicated by the fact that a single male was collected near Redding, Shasta Co., 450 feet elevation (40° 39′ N., 122° 24′ W.), at the northern end of the Sacramento Valley, and that the first, and southernmost specimen of *A. robiginosa* we saw was a male collected at Woodlake, Tulare Co., California, 24-V-1947 (36° 26′ N., 119° 07′ W.). This locality, at 450 feet elevation, is near the western foothills of the Sierra Nevada Mountains well toward the southern end of the San Joaquin Valley. Several attempts were made to collect *A. robiginosa* in this area without success, but *A. testacea* was fairly common. *A. robiginosa* probably no longer occurs in the Woodlake area for one or more reasons. Drainage and reclamation projects associated with agricultural development of the valley, which has been continuous from approximately 1850 to the present, may have forced *A. robiginosa* toward the foothills into a more restricted habitat. There it had to compete with an established and presumedly superior ecological homologue, *A. testacea.* The species might also have been eliminated from the area by the mosquito control program which began in 1922 when the Delta Mosquito Abatement District (Tulare Co.) was formed. A specimen of *A. robiginosa* was taken in 1947 at which time chlorinated hydrocarbons were in vogue. In the 1950's these pesticides were replaced by organo-phosphates for mosquito control work. During the five-year period 1964 through 1968, an annual average of 1,266 pounds of liquid ethyl parathion and 6,883 pounds of liquid Baytex (pounds of actual toxicants) were applied to aquatic habitats in the 712 square miles comprising this single district. There are 60 such districts in California (Anon. 1965–69), and currently, attempts are being made to expand the use of biological or ecological methods of mosquito control in their programs. If this trend persists, perhaps in time certain species may reappear in the urban or suburban aquatic habitats.

The extent of this former habitat may be surmised from diaries of early expeditions and travelers which describe a vast marsh extending north and south from the Stockton area, requiring a trip of hundreds of miles to go around it. The "vast marsh" implies a habitat which probably included mud banks and hummocks, much of which was

covered with thatches of dead vegetation under which hygrophilous snails could thrive—just as they do today in marshy habitats.

Although there is no laboratory data to confirm the biologies of *A. robiginosa* or *A. vernalis*, they are probably dependent on hygrophilous snails or their eggs, e.g., Succineidae, for oviposition sites and development of first-instar larvae which is the case with *A. testacea* (Fisher and Orth, 1964). Snails of the family Succineidae were present at all sites where *A. robiginosa* and/or *A. vernalis* were collected. These snails were especially abundant at Alturas, Willits, and Deep Springs.

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